AMENDMENTS TO THE CLAIMS

1-22. (Cancelled)

23. (New) An optical fiber sensor comprising:

an optical fiber portion for transmitting light;

mode restriction releasing means including a light permeable member melt bonded to a front end of the optical fiber portion, guiding at least a portion of the light transmitted by the optical fiber portion to the outside of a core to release a restriction of the mode of the light, and returning the light released in the restriction of the mode into the core,

said mode restriction releasing means being a hetero core provided with a light transmitting core having a different diameter from the core of the optical fiber portion and able to transmit light propagated through the core and shorter in comparison with the length of the optical fiber portion; and further comprising:

a metal film provided at a surface side of said hetero core and generating surface plasmon by reflection of light in the hetero core at that surface; and

reflection means for reflecting light in the hetero core and returning the light to said optical fiber portion side at the surface of the end of the hetero core opposite to the end melt bonded to the optical fiber portion.

24. (New) An optical fiber sensor comprising:

an optical fiber portion for transmitting light;

mode restriction releasing means including a light permeable member melt bonded to a front end of the optical fiber portion, guiding at least a portion of the light transmitted by the optical fiber portion to the outside of a core to release a restriction of the mode of the light, and returning the light released in the restriction of the mode into the core,

said mode restriction releasing means being a hetero core provided with a light transmitting core having a different diameter from the core of the optical fiber portion and able to transmit light propagated through the core and shorter in comparison with the length of the optical fiber portion;

a detection chemical immobilizing film selectively reacting with a detection object at the outside of said hetero core and giving a change in accordance with that reaction to the light in the hetero core formed at a surface side of said hetero core; and

reflection means for reflecting light in the hetero core and returning the light to said optical fiber portion side at the surface of the end of the hetero core opposite to the end melt bonded to the optical fiber portion.

25. (New) A measuring apparatus comprising:

an optical fiber sensor including

an optical fiber portion for transmitting light;

mode restriction releasing means including a light permeable member melt bonded to a front end of the optical fiber portion, guiding at least a portion of the light transmitted by the optical fiber portion to the outside of a core to release a restriction of the mode of the light, and returning the light released in the restriction of the mode into the core,

said mode restriction releasing means being a hetero core provided with a light transmitting core having a different diameter from the core of the optical fiber portion and able to transmit light propagated through the core and shorter in comparison with the length of the optical fiber portion; and further comprising:

a metal film provided at a surface side of said hetero core and generating surface plasmon by reflection of light in the hetero core at that surface; and

reflection means for reflecting light in the hetero core and returning the light to said optical fiber portion side at the surface of the end of the hetero core opposite to the end melt bonded to the optical fiber portion;

a light source connected to an optical fiber portion side end of the optical fiber sensor and emitting light to the core of the optical fiber sensor; and

a light detecting means for detecting direct intensity of returned light returning to the light source side via the core subjected to interaction with the outside of the mode restriction releasing means in the mode restriction releasing means.

26. (New) The measuring apparatus as set forth in claim 25, further comprising:

measuring means for measuring a predetermined characteristic of an environment outside of said optical fiber sensor based on an intensity of said returned light detected by said light detecting means.

27. (New) A measuring apparatus comprising:

an optical fiber sensor including

an optical fiber portion for transmitting light;

mode restriction releasing means including a light permeable member melt bonded to a front end of the optical fiber portion, guiding at least a portion of the light transmitted by the optical fiber portion to the outside of a core to release a restriction of the mode of the light, and returning the light released in the restriction of the mode into the core,

said mode restriction releasing means being a hetero core provided with a light transmitting core having a different diameter from the core of the optical fiber portion and able to transmit light propagated through the core and shorter in comparison with the length of the optical fiber portion; and

a detection chemical immobilizing film selectively reacting with a detection object at the outside of said hetero core and giving a change in accordance with that reaction to the light in the hetero core formed at a surface side of said hetero core;

reflection means for reflecting light in the hetero core and returning the light to said optical fiber portion side at the surface of the end of the hetero core opposite to the end melt bonded to the optical fiber portion;

a light source connected to an optical fiber portion side end of the optical fiber sensor and emitting light to the core of the optical fiber sensor; and

a light detecting means for detecting direct intensity of returned light returning to the light source side via the core subjected to interaction with the outside of the mode restriction releasing means in the mode restriction releasing means.

28. (New) A measuring apparatus as set forth in claim 27, further comprising measuring means for measuring a predetermined characteristic of an environment outside of said optical fiber sensor based on an intensity of said returned light detected by said light detecting means.